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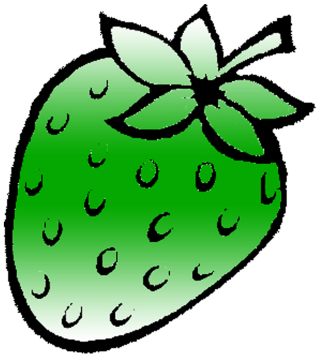

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UNIT I: OVERVIEW

Agenda

- General Organization and architecture
- Structural/functional view of a computer
- Evolution/brief history of computer.

Architecture & Organization

- **Computer Architecture** is those attributes visible to the programmer

  or

  those attributes that have a direct impact on the logical execution of a program
  - Instruction set, number of bits used for data representation, I/O mechanisms, addressing techniques.
  - e.g. Is there a multiply instruction?
- **Computer Organization** refers to the operational units & their interconnections that realize the architectural specifications. Basically, it is about how features are implemented.
  - Control signals, interfaces, memory technology.
  - e.g. Is there a hardware multiply unit or is it done by repeated addition?

Structure & Function

- Structure is the way in which components relate to each other
- Function is the operation of individual components as part of the structure

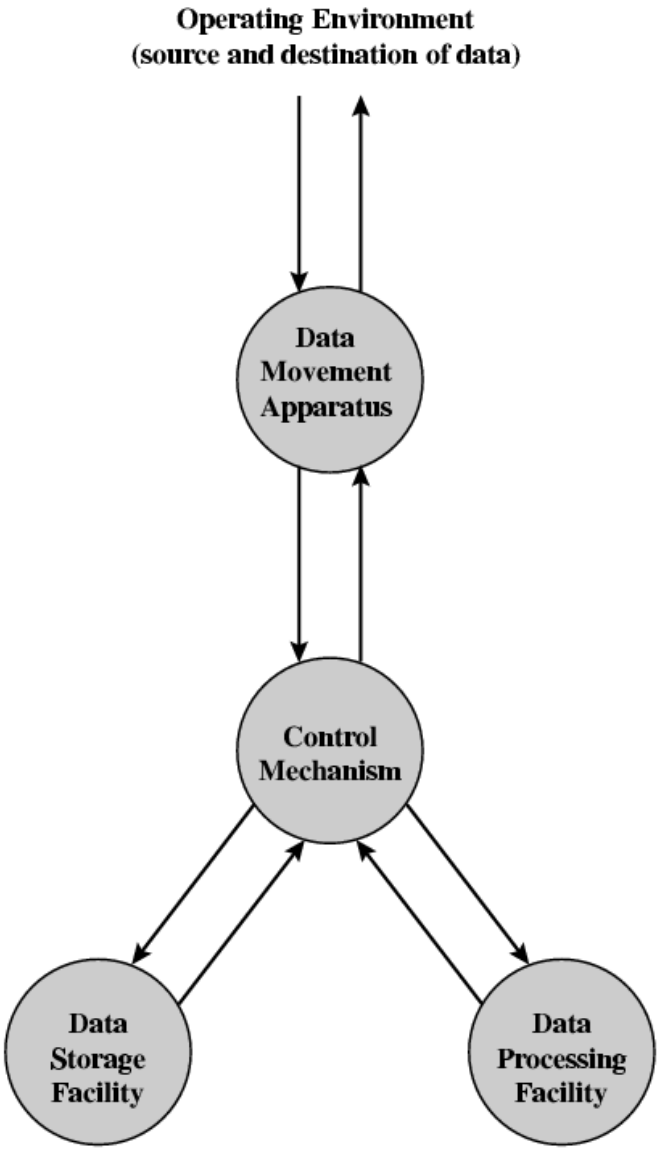
Function

- All computer functions are:
  - Data processing: Process data
  - Data storage: Store data
  - Data movement: Move data between itself & outside world.

    When data are received from or delivered to a device that is directly connected to the computer, the process is known as I/O and the device is known as peripheral.

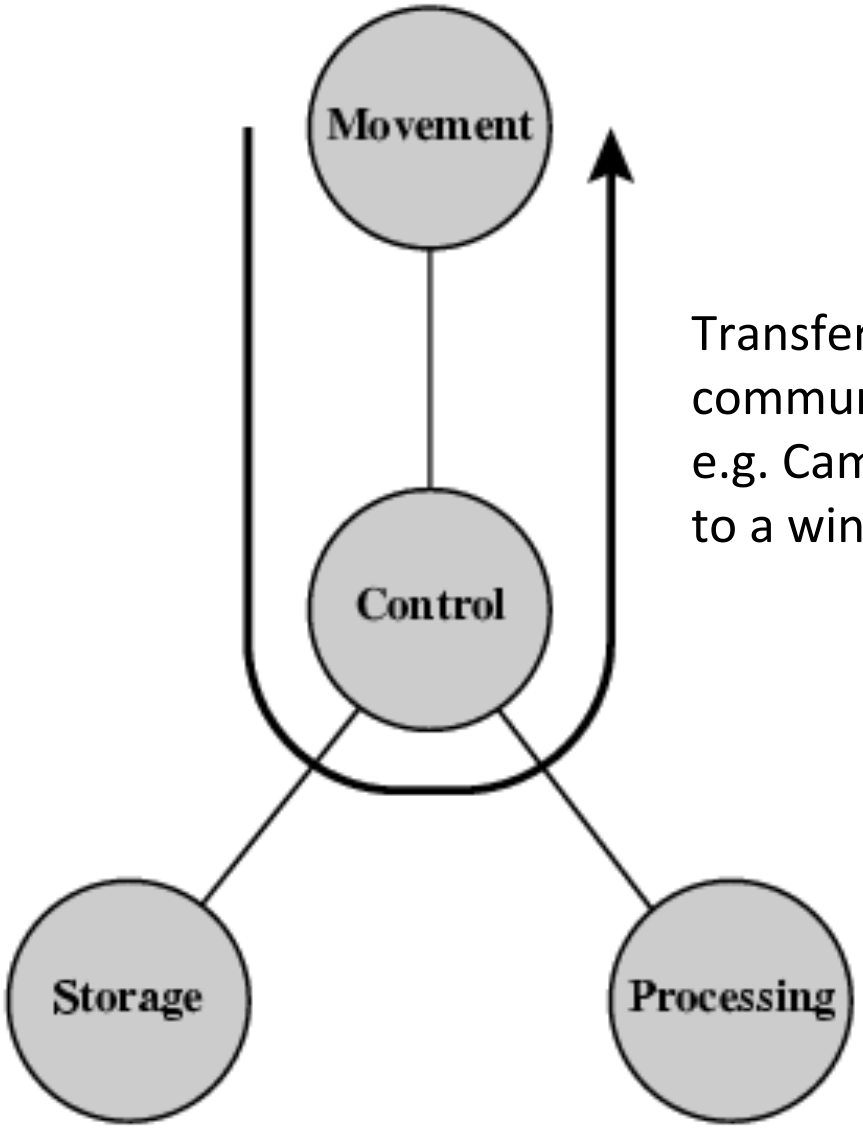
    When data are moved to or from a remote device, the process is known as data communications.
  - Control: Controls the above three functions by an individual who provides the computer with instructions.

Functional view



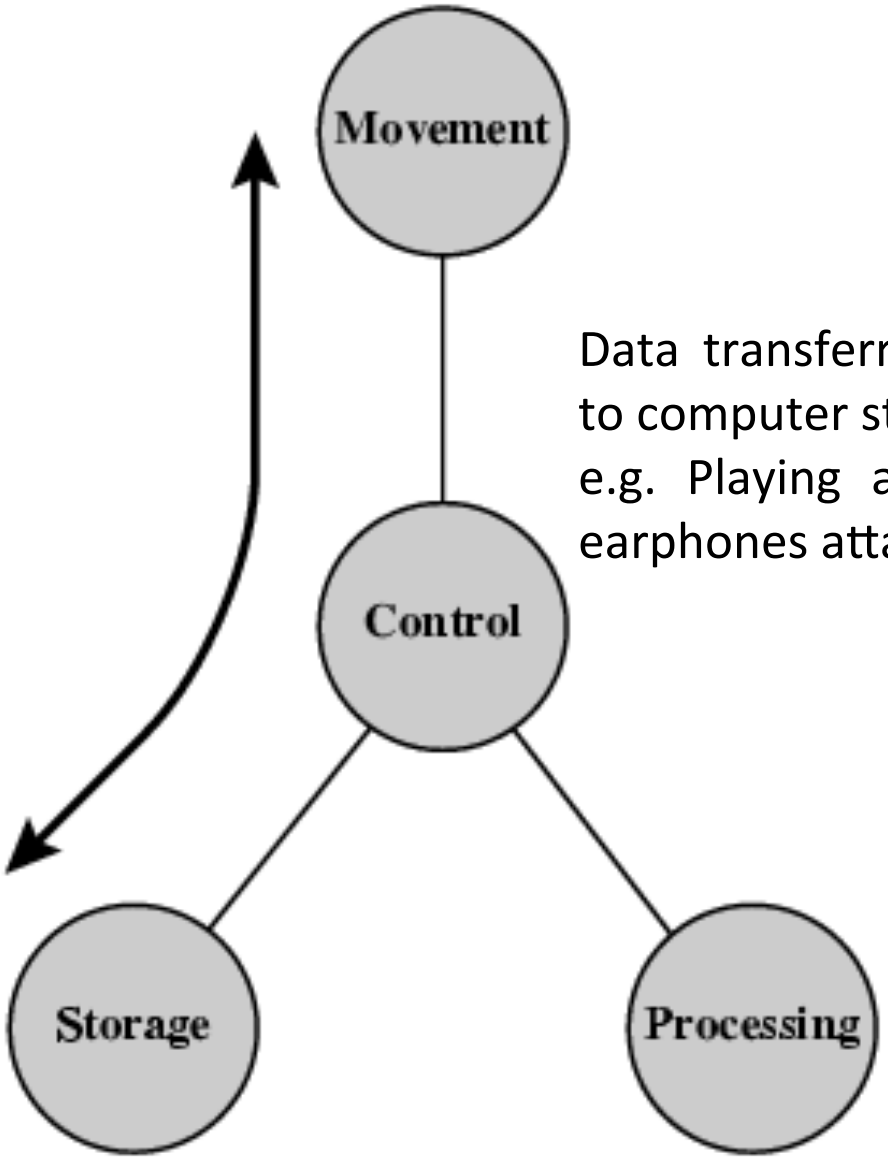
A Functional View of the Computer

Operations (1) Data movement



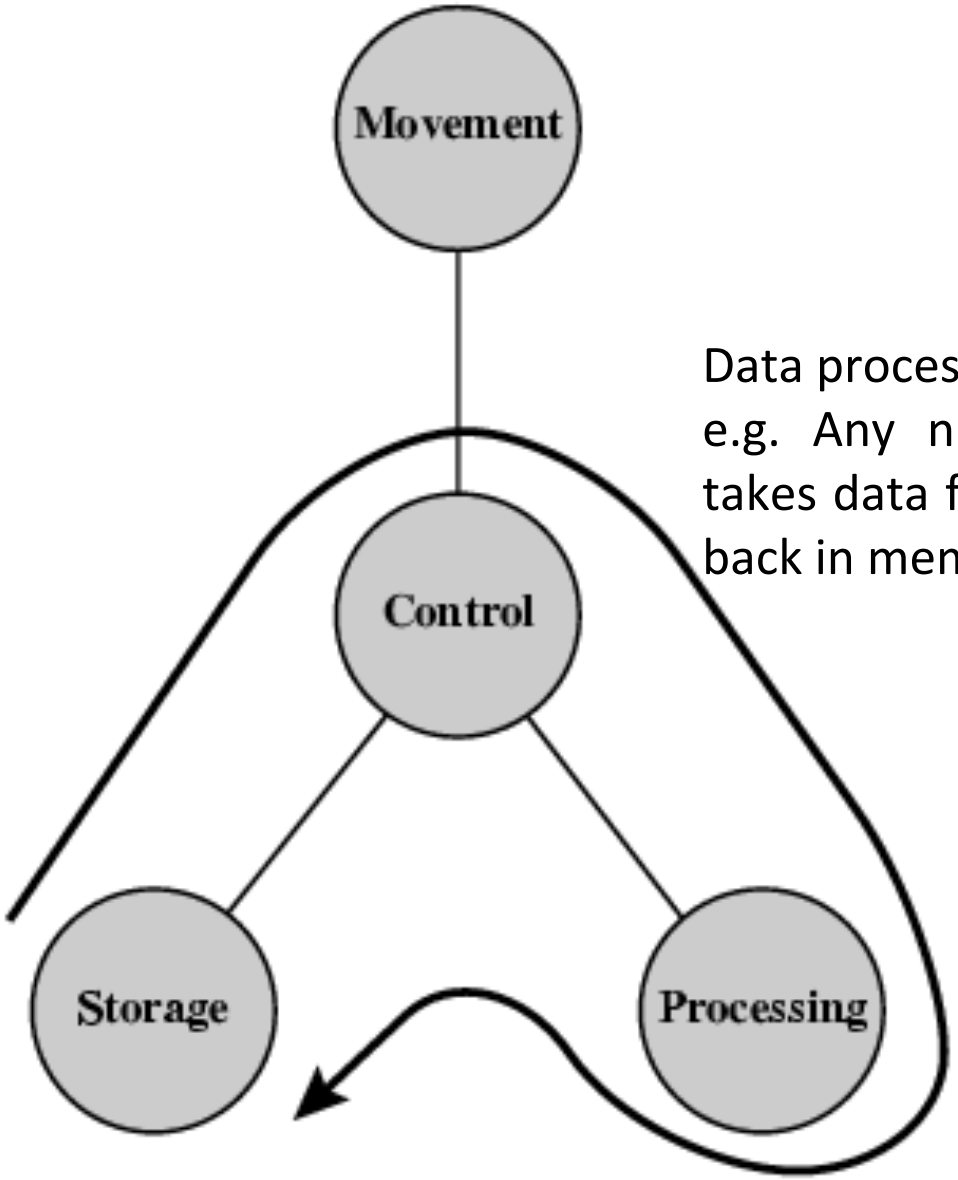
Transferring data from one peripheral or communication line to another.
e.g. Camera attached to a PC, sending the frames to a window on the screen of the same PC.

Operations (2) Storage



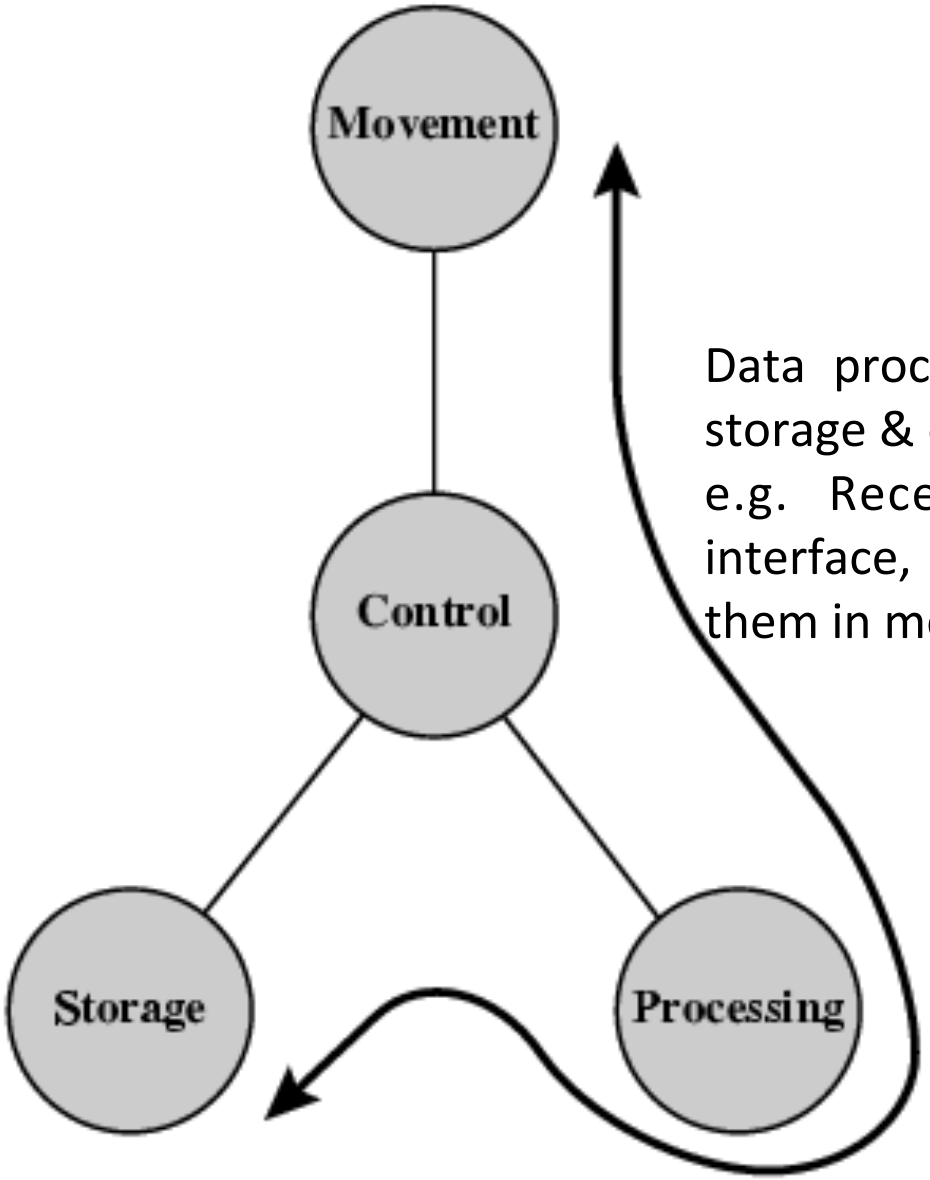
Data transferred from the external environment to computer storage & vice-versa.
e.g. Playing an mp3 file stored in memory to earphones attached to the same PC.

Operation (3) Processing from/to storage



Data processing on data in storage.
e.g. Any number-crunching application that takes data from memory and stores the result back in memory

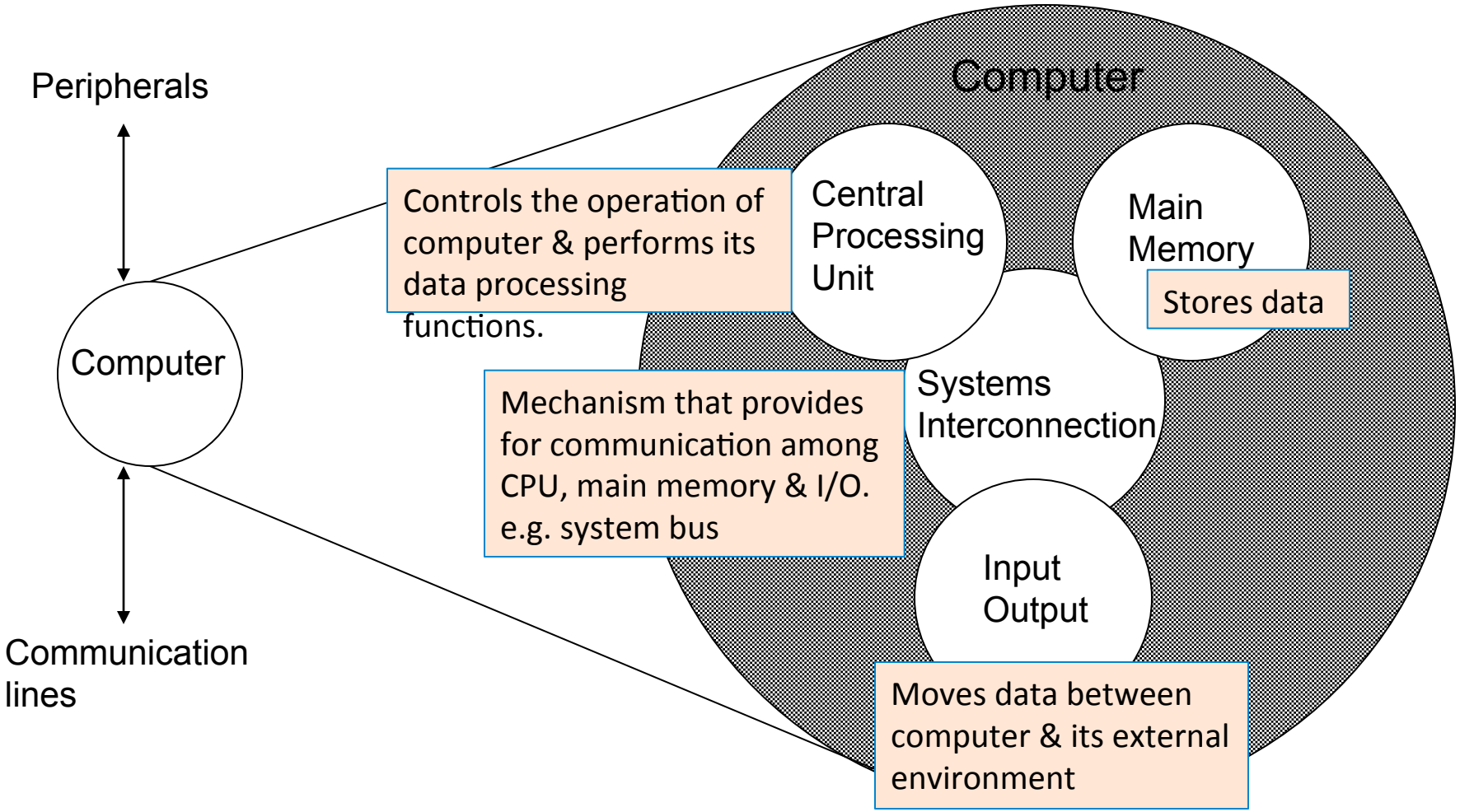
Operation (4) Processing from storage to I/O



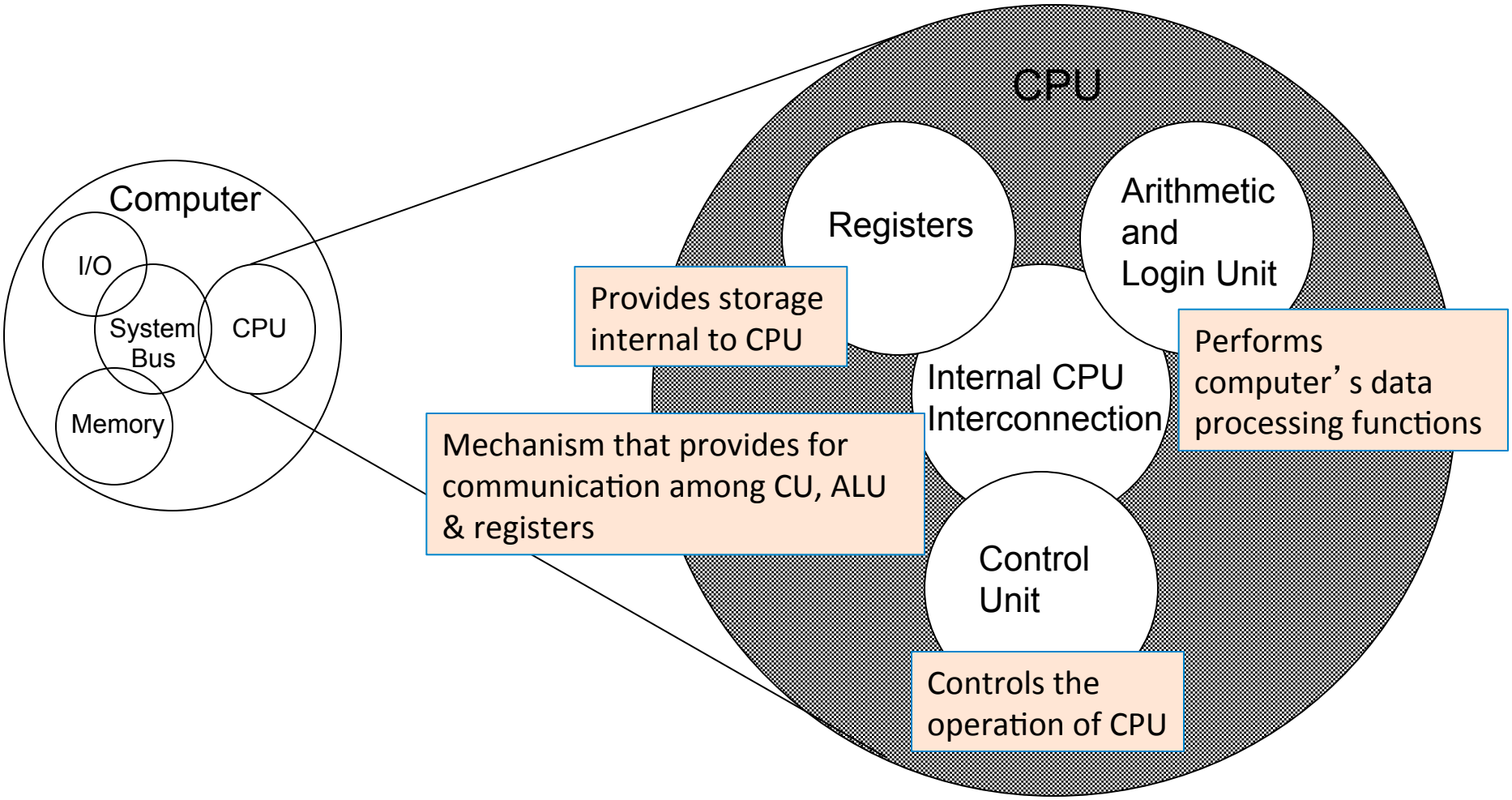
Data processing on data en-route between storage & external environment.

e.g. Receiving packets over a network interface, verifying their CRC, then storing them in memory.

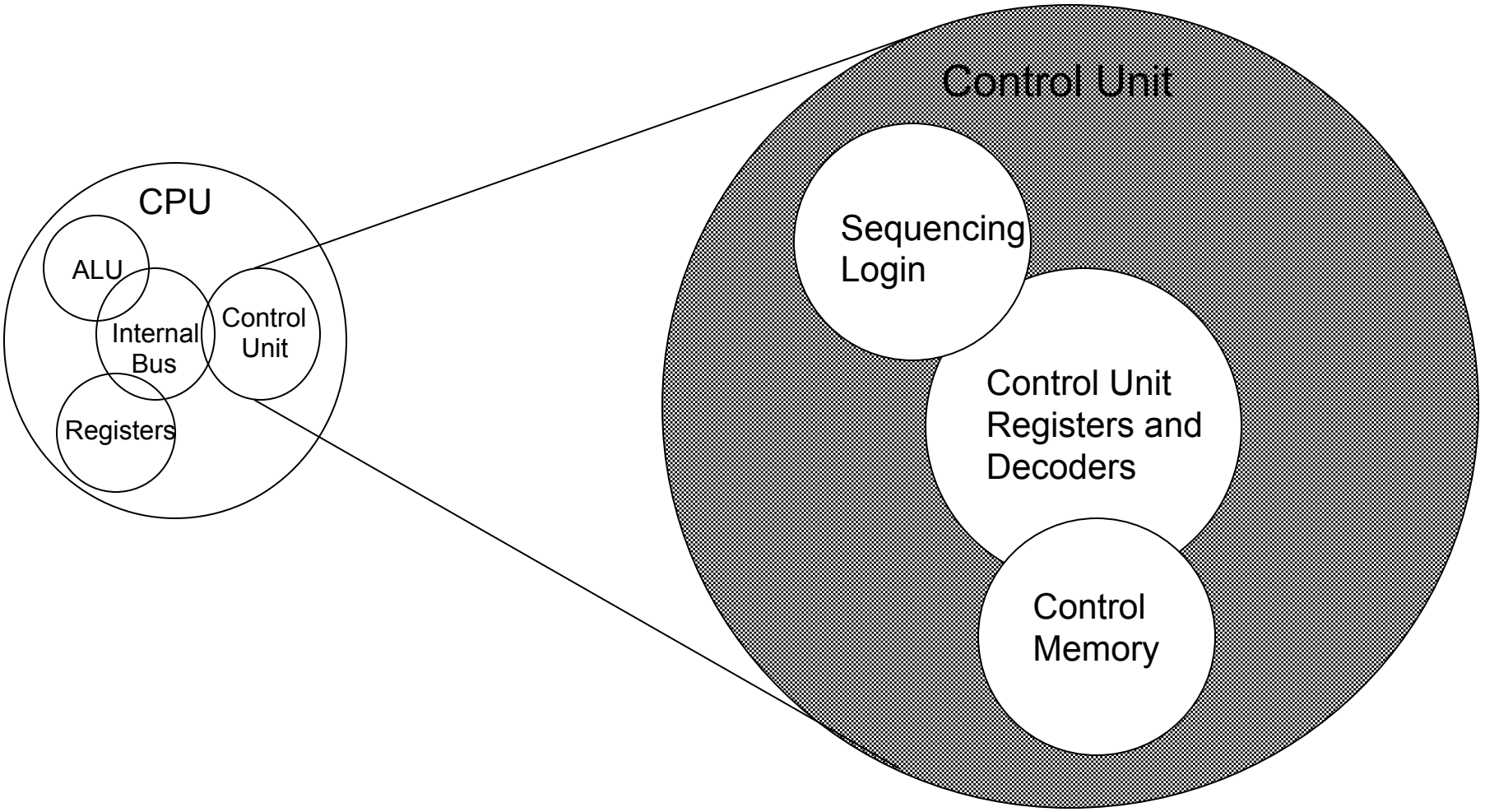
Structure - Top Level



Structure - The CPU



Structure - The Control Unit



Evolution of Computers
FIRST GENERATION (1945 – 1955)

- Program and data reside in the same memory (stored program concepts – John von Neumann)
- ALP was made used to write programs
- Vacuum tubes were used to implement the functions (ALU & CU design)
- Magnetic core and magnetic tape storage devices are used
- Using electronic vacuum tubes, as the switching components

SECOND GENERATION (1955 – 1965)

- Transistor were used to design ALU & CU
- HLL is used (FORTRAN)
- To convert HLL to MLL compiler were used
- Separate I/O processor were developed to operate in parallel with CPU, thus improving the performance
- Invention of the transistor which was faster, smaller and required considerably less power to operate

THIRD GENERATION (1965-1975)

- IC technology improved
- Improved IC technology helped in designing low cost, high speed processor and memory modules
- Multiprogramming, pipelining concepts were incorporated
- DOS allowed efficient and coordinate operation of computer system with multiple users
- Cache and virtual memory concepts were developed
- More than one circuit on a single silicon chip became available

FOURTH GENERATION (1975-1985)

- CPU – Termed as microprocessor
- INTEL, MOTOROLA, TEXAS,NATIONAL semiconductors started developing microprocessor
- Workstations, microprocessor (PC) & Notebook computers were developed
- Interconnection of different computer for better communication LAN,MAN,WAN
- Computational speed increased by 1000 times
- Specialized processors like Digital Signal Processor were also developed

BEYOND THE FOURTH GENERATION (1985 – TILL DATE)

- E-Commerce, E- banking, home office
- ARM, AMD, INTEL, MOTOROLA
- High speed processor - GHz speed
- Because of submicron IC technology lot of added features in small size

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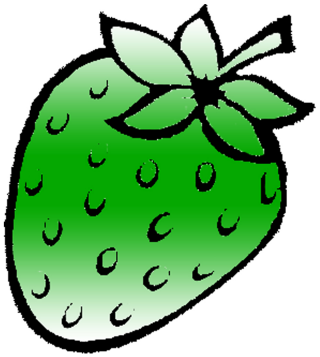

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